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ABSTRACT

R. Feuerstein's Instrumental Enrichment (IE) Program was used as a tool of cognitive educational intervention with 10 deaf children (ages 7 to 15), all recent immigrants from Ethiopia to Israel. The group's special education needs resulted from their deafness, lack of formal educational experience, lack of previous exposure to sign language or finger spelling, and limited information about and experience with a modern technological society. Instrumental enrichment was focused on formation of elementary learning processes and cognitive functions. Special didactics used with this group included simultaneous mediation in four dimensions: (1) the graphic image of an object, (2) the written name of the object, (3) the sign designating the object, and (4) a motor response. Generalization was taught using a sequence from the IE material to the embedded principle, to an example, then back to the principle, and finally, to a second example. Students demonstrated significant improvement in their cognitive and metacognitive skills. An example of a student's progress is attached. (Contains 10 references.) (DB)

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APPLICATION OF INSTRUMENTAL ENRICHMENT COGNITIVE INTERVENTION PROGRAM WITH DEAF IMMIGRANT CHILDREN FROM ETHIOPIA

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Abstract

Feuerstein's Instrumental Enrichment (IE) program was used as a tool of cognitive educational intervention with a group of deaf children (age range 7-15) - recent immigrants from Ethiopia. The special educational needs of this group are determined by their deafness, lack of formal educational experience, lack of previous exposure to sign language or finger spelling, and their limited amount of information regarding a modern technological society. The work with IE instruments appeared as a general paradigm of learning activity and concept formation. Many of the elementary learning processes and cognitive functions had to be formed from the beginning. Special didactics of applying IE requires simultaneous mediation in four different dimensions: The graphic image of the object, the written name of the object, the sign designating the object, and a motor response. Teaching generalization includes a sequence: From IE material to embedded principle, then to example, then back to principle and finally to second example. The effectiveness of IE intervention is demonstrated by the data of dynamic cognitive assessments and the progress in mastering new IE instruments.

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Instrumental Enrichment Program

Instrumental Enrichment (IE) cognitive intervention program (Feuerstein, 1980; 1990) is based on the theories of structural cognitive modifiability and mediated learning experience. IE materials include 14 booklets of paper-and pencil tasks aimed at creating in students cognitive prerequisites of learning and developing their learning strategies. IE booklets cover such domains as analytic perception, orientation in space and time, principles of comparison and classification, and so on. Teaching IE presupposes special didactics based on the principles of mediated learning which emphasize intentionality of teacher/student interaction, transcendence of the principles discovered in the course of study, mediation of meaning, and a number of other parameters elaborated by Feuerstein (1990). The IE program proved to be effective in correcting students' deficient cognitive functions such as unsystematic exploratory behavior, lack of planning, absence of the need for logical evidence, egocentric nature of responses, etc. IE allows the enrichment of the students' repertoire of basic concepts, verbal labels, and cognitive operations. It contributes to the development of inner and task-related motivation and creates conditions for reflexive thought and metacognitive awareness.

Application of IE with various populations of educationally deprived and socially disadvantaged students demonstrated its effectiveness in inducing cognitive change (Rand, Tannenbaum, & Feuerstein, 1979; Ben Hur, 1994). Pilot data on the implementation of the IE program with deaf students (Thickpenny

1982; Martin, 1985; Martin 1995) indicated that both learning strategies and cognitive functioning of these students can be improved though exposure to IE. To the best of our knowledge, however, the IE program has never been used with new immigrant students who are deaf.

Educational integration of immigrant students

During the last decade the Israeli educational system has had to deal with the problem of educationally integrating new immigrants from Ethiopia, the majority of whom had very little formal learning experience. This problem was aggravated in the case of deaf immigrant students.

The educational problems of this group of students are two-fold. On the one hand, being deaf, they lacked the tools to acquire a new culture and adapt to a formal education framework. Because of their hearing impediment these children remained educationally deprived, and to a certain extent, culturally deprived within their native society. The Ethiopian society apparently lacked the necessary approaches and tools for educating deaf children even within the traditional family framework. As a result, deaf Ethiopian children were bereft of language of any sort - whether verbal, or sign-based.

On the other hand, as new immigrants from a "traditional" society they experienced severe adaptational stress. Similarly to all immigrants, they were faced with the need to learn a new language, accept new social norms and rules of behavior. Most of their stress was related to their transition to an unfamiliar

educational environment which posed new and challenging learning requirements. It should be remembered that the regular daily school experience was completely alien to the deaf Ethiopian immigrants.

It soon became clear that deaf immigrant students who lacked any type of language and were unfamiliar with the most besic learning skills would not be able to achieve educational integration without special help. We tried to provide such help by means of the Instrumental Enrichment (IE) program described at the beginning of this paper. The IE program is aimed at developing very general cognitive and metacognitive skills, such as problem analysis, comparison, categorization, planning, elaboration of different cognitive strategies, and so on. These skills are necessary for all types of learning activity and are used in all regular school subjects. The IE program teaches students how to recognize and formulate a cognitive principle, and then "bridge" this principle to diverse realms in everyday experience and school-based learning.

Students and teachers

The IE program was taught to ten Ethiopian immigrant students at the Jerusalem "Alliance" School for the Deaf. The age of the students, their previous learning experience, hearing deficiencies, and their manifest level of functioning varied significantly. The age range was from 8 to 15, while hearing impairment ranged from total deafness to residual hearing, which, however, was insufficient for spontaneous language acquisition.

Some of our students had never seen a pencil in their life and did not understand the meaning of school-based education. Other students were better prepared and readily grasped the new knowledge and skills. They demonstrated a relatively high level of performance after only a few months of learning. However, both types of students had very little experience with language, whether verbal, or sign.

Two IE teachers participated in the program. One of them was a new immigrant teacher from Ethiopia with additional training in Israel. The teachers were supervised weekly by the IE counselor. The IE program for a total of 20 hours per week was taught in the form of individual tutoring and small group lessons.

Implementation of the IE program

The IE program by its very nature, is flexible and can be adjusted and re-focused toward the specific cognitive needs of the target group of students. In our case the main goal of IE intervention was to provide students with conceptual tools for the development of their thinking and learning skills. In other words we focused on the development of conceptual language in our students. This was achieved through the use of multiple input modalities including sign language, finger spelling, as well as written and oral speech.

The first and most serious problem was that our students lacked concepts pertaining both to the sphere of learning activity and everyday life. Suffice it to say that they lacked concepts such as "dot" and "family". Because the students lacked

a spontaneous conceptual system we had to create this conceptual basis from the very beginning. Vygotsky (1994) observed that the process of concept formation assumes a different form in special populations. Regular students first acquire basic everyday concepts spontaneously, and only later become acquainted with systematic "scientific" concepts taught at school. Vygotsky proposed that in the framework of education of students with special needs this proportion between "everyday" and "scientific" concepts should be reversed. Many concepts which are formed spontaneously by regular students, should be introduced in a systematic, "scientific" way to special education students. We were able to observe this changed balance in our students who first acquired basic concepts in the framework of school learning and only later started using them in everyday life contexts.

Thus, in preparing to the work with IE pages the students had first to be introduced to the basic concepts pertaining to the sphere of school learning. These concepts included the notions of lesson, task, model, explanation, independent work, dot, line, picture, background, framework and so on. The acquisition of concepts was simultaneous with the acquisition of communicative sign language. A number of concepts were taught even before they appeared in the students' sign speech. The concept was introduced as a unity of a number of modalities: sign, finger-spelling, writing, oral, graphic, motor and numerical.

As an illustration consider the following introduction of the notion of "dot". As one of the teachers observed "our

students started to learn about the world from one...dot". This poetic expression was not far from reality. The concept of dot was presented first as a sign: "dot". Simultaneously whilst showing the sign, the teacher drew a dot and presented the written word "dot". Though at that stage students did not recognize letters, we tried to introduce global reading. After such an introduction the student was requested to show a dot, which meant that the student had to recognize the word "dot" (in sign, written or oral modality) and to relate it to the graphic object. Then the student was asked to draw a dot and name it. Later, when the first stage of acquiring literacy was over, the students were taught to read, write and finger-spell the word "dot". Then the concept of dot was connected to the numerical concept of "one" and then to "many". From these concepts, as from the base, the advancement was made toward such concepts as "few", "together", "separately", and "group". Once acquired, these concepts provided the basis for performing simple classifications.

When the basic concepts mentioned above were acquired and the necessary communicative base was established we were able to introduce our students to the IE material. Specially for our students, the teaching of each IE instrument included two successive phases. During the first phase the main goal was to create in the students' minds the general structure of concepts pertaining to the learning process. During the second phase the main goal was to develop the students' ability to regulate their own cognitive activity using the already acquired conceptual tools. The reason for these two-step didactics stems from the

specificity of our students' cognition. Their cognitive development was taking place in the constant interaction between the verbal-conceptual field and non-verbal cognitive field. To illustrate this process let us consider the work with one of the first pages of the instrument "Analytic Perception" (Fig.1).

Figure 1

The task here is to find the model figure presented on the left within each of the designs on the right. To solve this task the students had to acquire a number of basic concepts such as "task", "line", "example", "model", "same", "to find", "to color". Since the students could not read the written instructions they were instructed in a simplified sign language. Initially, the students' activity was based primarily on imitating the teacher: Do the same, find the same, color the same. After the students learned basic concepts and started reading instructions, the second stage of learning started. The students were simultaneously given an oral and a sign question: "What is the name of this figure?" The answer was: "A square" (in sign modality). The teacher continued: "Here you have to find the same square within each of the pictures. (The teacher finger-spelled "square", without using sign language). The "same" means, that this should be a square of the same size as the model. The direction can be different." Transition from the first to the second stage was marked by the considerable expansion of the students' active conceptual vocabulary which included such notions as "square", "size", "figure", "model", "direction", "difference", "length", "side", all types of forms and so on. In

addition, the students acquired some basic self-evaluation skills and improved their understanding of instructions. It became possible, for example, to receive an absolutely adequate response to the instruction, like: "Take the ruler and check your solution".

The conceptual base described above allowed our students not only to comprehend the learning material they were working with but also to start identifying, controlling and planning their own learning activities. Thus, cognitive learning became augumented by meta-cognitive awareness. The meta-cognitive awareness of the students' own thinking and learning strategies became indispensable when students had to identify the main idea of a given segment of learning material, classify it, organize and plan problem solving actions. These organizational and planning skills can then be "bridged" from IE to content subject lessons. As an example let us consider a page from the IE instrument "Illustrations" (Fig.2).

Figure 2

This page is composed of three frames presenting three consecutive episodes which together form a humorous story. The main goal of the work with this page is to develop in the students the notion of "cause-and-effect" relations. Working with this page we emphasized the formal aspects of the task rather than the content of the humorous story. As a result the following plan has been developed which helped students to organize and plan their own thinking about this page:

1) Why could the car not enter the tunnel?

2) What has the driver decided to do?

3) Can the car enter the tunnel now?

After the students learned how to prepare such a plan, this new mastery was extended beyond the work with concrete IE pages. Similar plans were written for preparing students' responses in content subject lessons. The students were taught how to create their thematic answers as short successive responses to the clearly defined questions. Some of the more advanced students were able to create these plans independently. For example, while studying the theme "Jews of Europe" students became oriented in the material through questions posed by the teacher, such as: "Why are the Jews of Europe known as 'Ashkenazim'?"; "Which countries did the Jews come from to Europe?"; "Did the Jews of Europe possess passports?"

Outcomes of the IE intervention

For the majority of our students IE intervention lasted less than a two academic years. At the beginning of intervention all of them lacked any type of communicative language (either oral or sign), they had very vague ideas about the goals and methods of school-based education, and lacked cognitive tools essential for the school-based learning activity. At the time of the post-test following IE intervention all students were capable of understanding the meaning of the IE pages, of identifying objects, geometric figures and grapho-symbolic devices used in IE instruments. They started using superordinate concepts such as size, form and direction. They mastered the planning of their problem-solving activity and evaluation of its results. The following two case studies illustrate different patterns of

cognitive enrichment in two of our students.

Student A. She was nine years old at the beginning of the program and had no previous educational experience. She had no prior knowledge of the school environment or the functioning of the most simple things in the classroom. The girl knew neither sign language nor oral speech that would facilitate her communication with other children and teachers at school. Following several months of initial educational intervention it became possible to test her using the dynamic methods of cognitive assessment (Feuerstein, 1979).

Figure 3

In Figure 3 one can see the results of the "Diamond Drawing" test, including the teacher's model of a diamond and several of the girl's attempts to copy it. Objects No.1 and 2 reflect the girl's initial attempts to copy the model. One can see that the girl was unable even to keep the task in mind. Then the learning phase of the test, organized according to the principle of mediated learning experience, was initiated. Since the means of verbal intervention were limited, mediation was given in a grapho-motor modality. Diamond No.3 was drawn by the teacher and the girl together. The teacher marked the dots, and the girl had to join them. Finally, Diamond No.4 represents the result of the girl's independent work following mediation. The girl demonstrated high sensitivity to mediated learning which allowed us to believe in her relatively high learning potential.

Figure 4

Fig. 4 shows the results of copying the Complex Diamond by the

same girl after a year of IE intervention. Before starting the actual copying the girl spent considerable time analyzing the structure of the model. When she started to copy it she began with the main structural elements: the crossed lines. After that she drew the sides of the diamond, and finally filled different segments of the diamond with appropriate geometric figures. Not only was the copy complete, but in the process of copying the most effective strategy was used.

The improvement in the field of problem-solving and logical reasoning achieved by this girl is underscored by the fact that after IE intervention she was able to independently solve 26 out of 36 tasks in the Raven Colored Matrices Test - the tasks which were completely beyond her comprehension prior to intervention.

Student B. This student, who was 15 years old at the beginning of the program demonstrated at that time the highest level of cognitive performance relative to that of her peers. At the pre-intervention test she independently solved 23 out of 36 tasks in the Raven Colored Matrices Test. This result, though the highest in the group of our students, should be considered as quite modest if compared to the Israeli norm. In actual fact, the Colored Matrices are used only for children under the age of 10. In the post-intervention test Student B. was given the Raven Standard Progressive Matrices and she independently solved 42 out of 60 tasks. This result lies within the normal performance range of the regular Israeli students of her age.

The performance of the rest of the students lies between the extremes illustrated by cases A. and B. The mean Raven Colored

Matrices pre-test score was 45%, the post-test score was 59%. The mean score in the Rey-Osterrieth Complex Figure drawing was 45.6% in the pre-test and 68.3% in the post-test. (Because of the small size of the group statistical measures are omitted).

These optimistic results should not obscure certain problems discovered during the course of IE intervention. The most serious of them is a mis-match between considerable progress in reasoning and acquisition of problem-solving strategies and slower progress in the verbal sphere. Language development exercises incorporated in the application of the IE program were insufficient for the students. In future application of IE with the populations of culturally different deaf students much more emphasis should be placed on the development of communicative and verbal-conceptual tools which support the advanced forms of learning.

Conclusion

On the basis of this pilot study one can draw some conclusions. The study confirmed that IE is an appropriate and effective intervention program for the enhancement of cognitive functions in deaf immigrant students. Special didactic methods of IE application attuned to the needs of such students have been developed. Students participating in the program demonstrated significant improvement in their cognitive and meta-cognitive skills essential for successful school-based learning. The need for integration of language development activities into the cognitive enhancement program was identified.

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Acknowledgments

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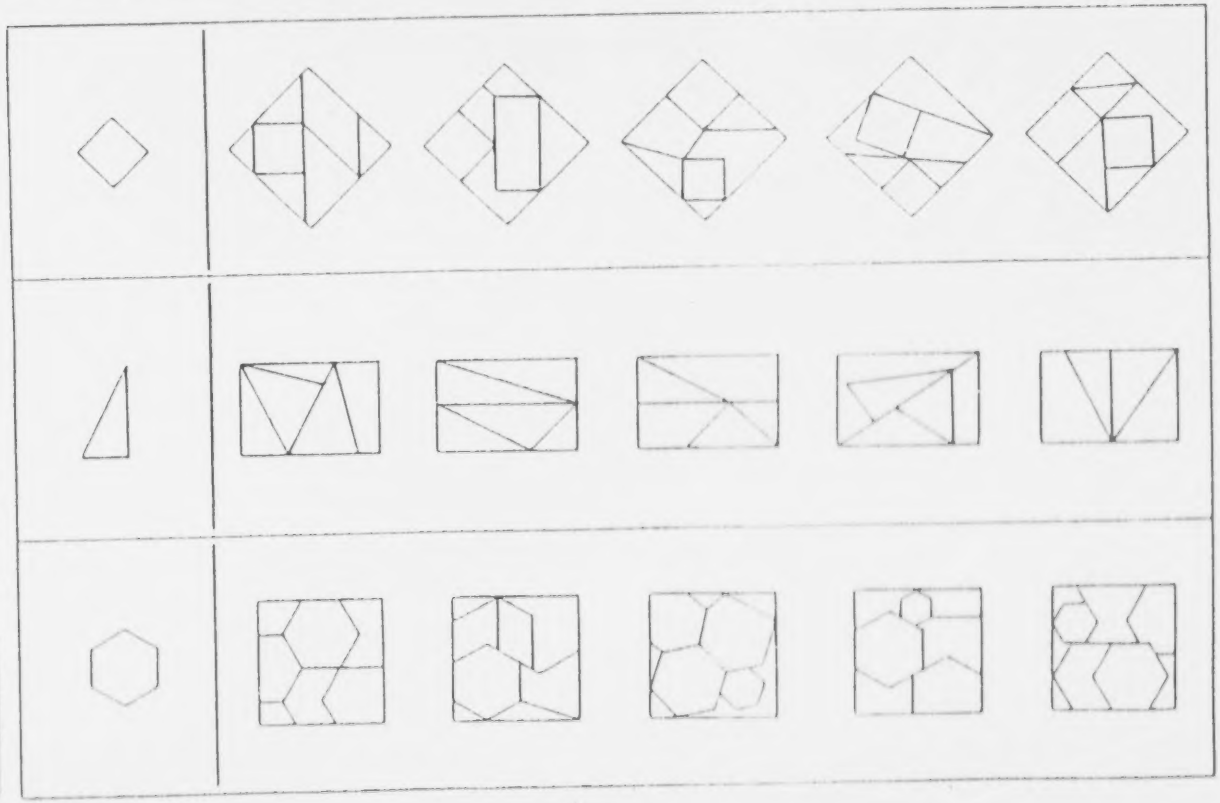
At the left of each row is a part that is hidden in each of the complete designs in that row.
Locate the part in each design and color it.
In the design, the part may appear in an orientation different from that of the model.

2



Analytic Perception - 2

Figure 1

9

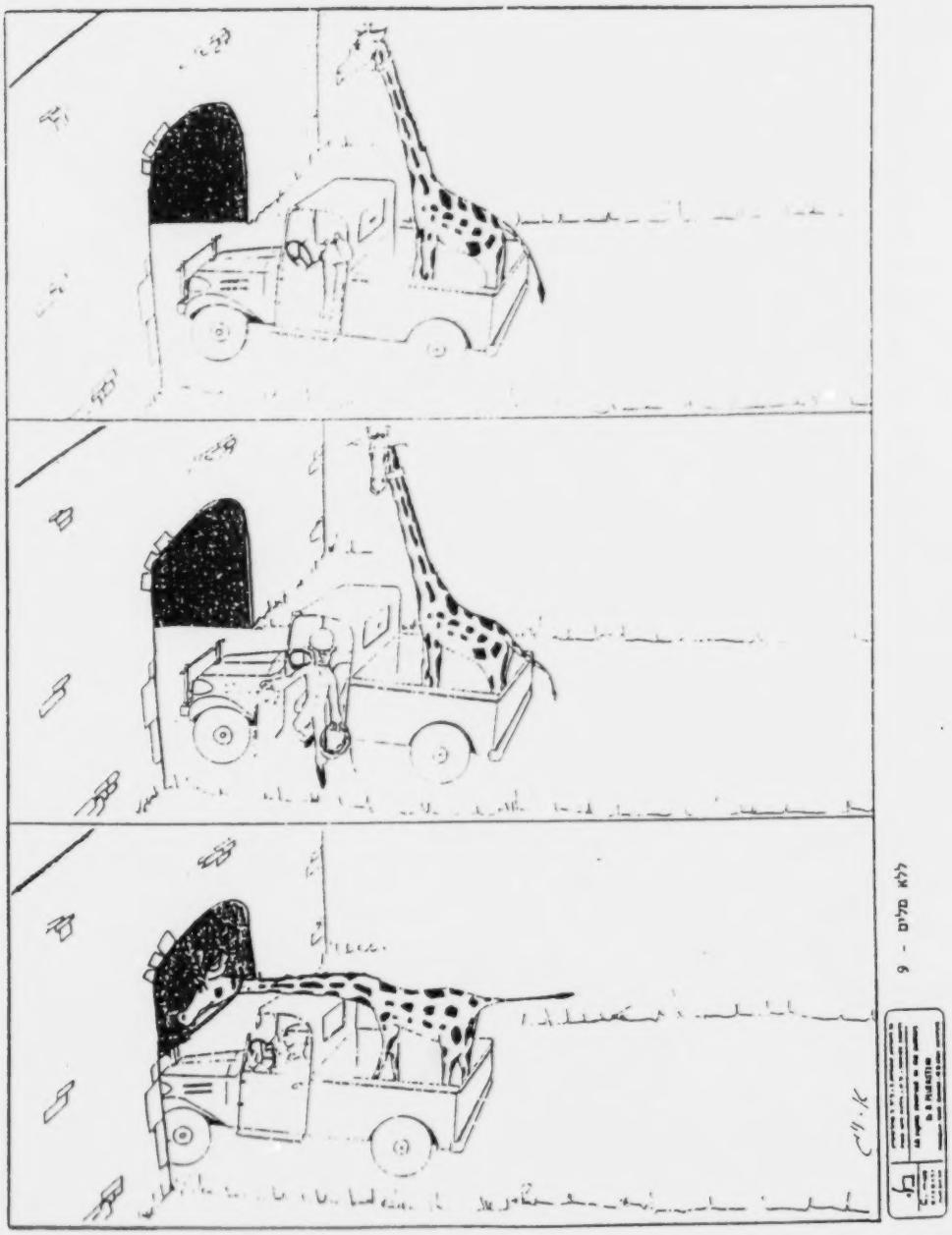


Figure 2

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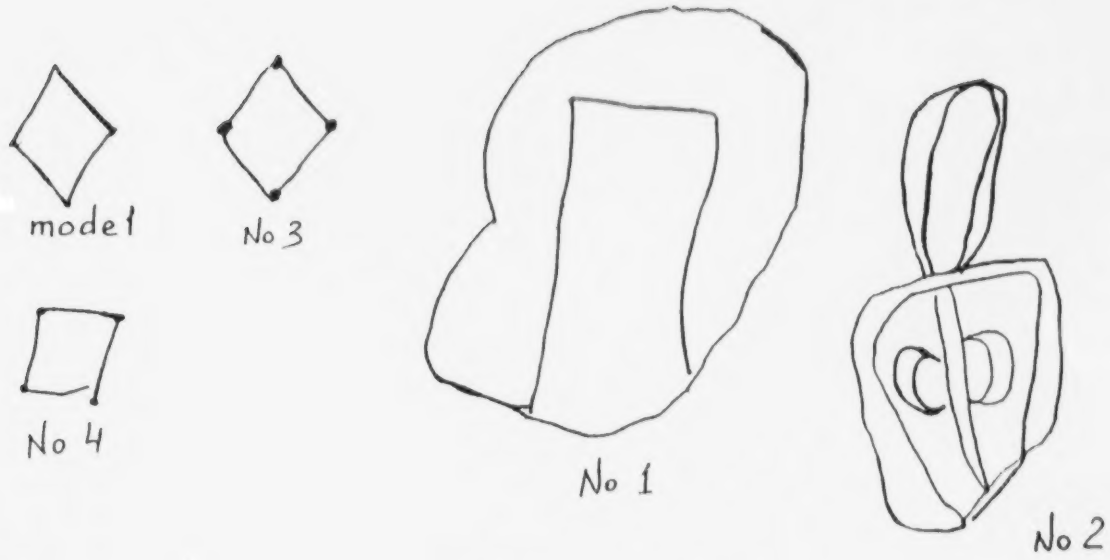

Figure 3

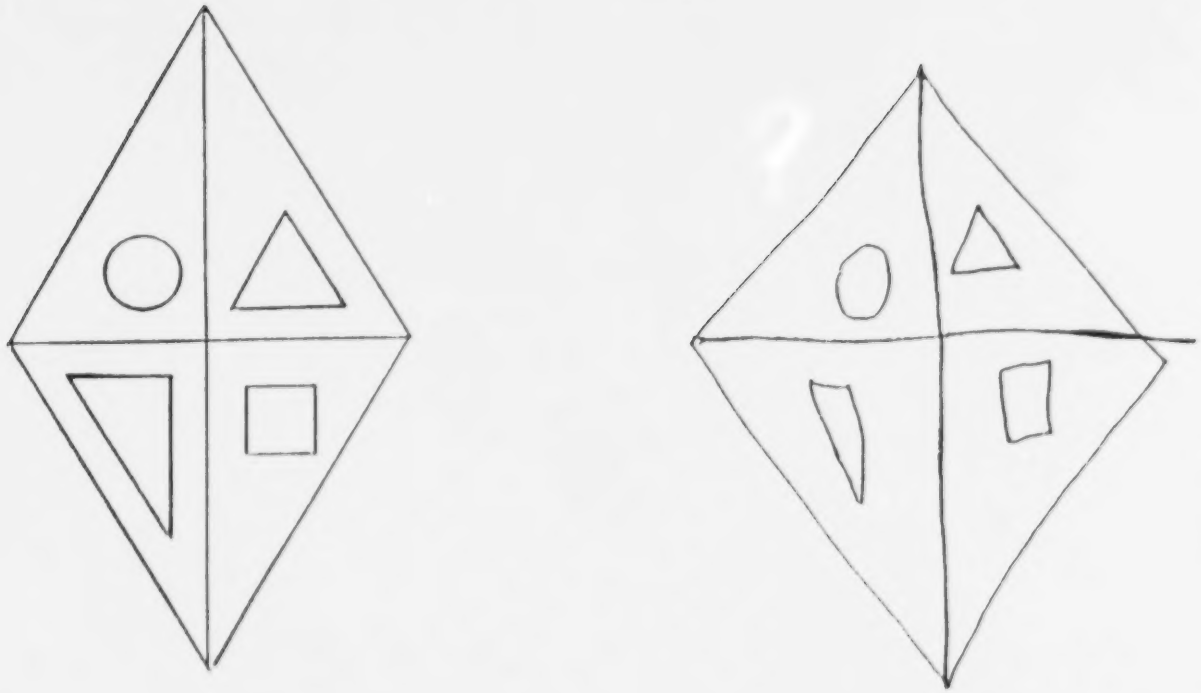

Figure 4